

Easy Pathology

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Respiratory System Diseases



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VISIT...

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Rhinitis

Inflammation of nasal mucosa

- **Acute** : catarrhal inflammation due to infection (Rhinovirus), or Allergy (Neutrophils & inflamed cells – dilated vessels – inflammatory edema)

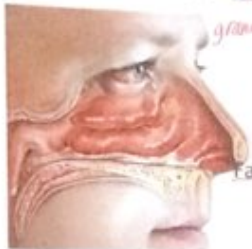
- **Chronic**:

Specific (Rhinoscleroma, Leprosy, TB)

Non-Specific (no granuloma)

1. **Atrophic** : common in females (unknown cause). Leads to anosmia
Familial – Endocrinal – Autoimmune – Viral – Bacterial – Nutritional deficiency

2. **Hypertrophic** : repeated attacks (e.g. allergic) → nasal polyps



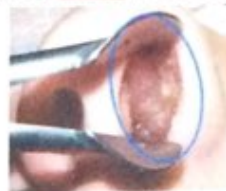
Nasal polyps

Gross : soft & pink semi translucent nodules.

Microscopic

core : edematous fibrous tissue with proliferated glands & excess eosinophils

The covering : may show ulceration, hyperplasia & Squamous metaplasia.



Tumors of the Nose:

Benign (e.g. papilloma, hemangioma), **Malignant** (Sq. C.C., Sarcomas)

Epistaxis:

Local causes (Rhinitis, tumors, trauma), TB

General causes (Hypertension, Bleeding tendency, Leukemia, vitamin C & K deficiency, Systemic infections)

Tonsillitis

Aetiology : infection (strept.)

Morphology:

Acute Parenchymatous: Diffuse red inflammation of tonsils

Acute Follicular (suppurative): Red swollen with pus in crypts (yellow dots)

Peritonsillar Abscess (Quincy) : unilateral with deviated uvula & Locked jaw (trismus)

Chronic: non specific following acute, or specific (TB)

Complications :

- **Spread**: (Direct – Lymphatic – Blood)
- **Chronic** (atrophy & fibrosis) (7x1, 5x2, 3x3)
- **Immunological** (Rheumatic fever – Acute GN)



Diphtheria

Aetiology: diphtheria, **exotoxin** producing, common in Children

Morphology: Acute inflammation & swelling → **Pseudo-membranous** (Neutrophil cells, fibrin, red cells)
inflammation (describe from general pathology)

Complications:

- Paralysis of larynx, palate
- **Asphyxia** (edema & detached membrane)
- **Zenker's degeneration** (due to **toxemia**)
- **Endocrinal crisis** (shock due to **suprarenal necrosis**)
- **Toxemia & toxic myocarditis**



Laryngitis: **Acute** (viral, bacteria, Allergic, voice trauma), **Chronic non specific** (following acute, **smoking**), **Chronic specific** (TB, **Laryngeoscleroma**)

Handwritten notes: vocal cords, hoarseness of voice, hyaline of vocal ms.

Laryngeal polyp

(**Singer's nodule**)

Non inflammatory, **non** neoplastic nodule of vocal cords due to **voice trauma** or smoking

Site: **Middle** third of vocal cords

Gross: Rounded small nodule (**0.5 cm**)

Micro: **Edema**, **fibrosis** & vascular proliferation → **Hyalinosis** & vascular dilatation

Complications: **Hoarseness** of voice - **Recurrence**

Handwritten notes: later, surgical, علاجات جراحية, نodule, نodule



Laryngeal Squamous cell Papilloma

Benign

	Adult type	Juvenile papillomatosis
P.F.	Unknown	HPV
number	single	Multiple small papillomatosis
Complications	-Hoarseness -Malignant transformation	-Hoarseness & stridor -No malignant transformation - Recurrent
		

Handwritten notes: علاجات جراحية, نodule, نodule

Other benign tumors: Fibroma, chondroma, hemangioma

Laryngeal Carcinoma

Malignant tumor arising from laryngeal epithelium

Incidence: **males** > females, >50 y 2% of all cancers. 95% of laryngeal cancers

P.F.: **Smoking**, Asbestos, Alcohol, **HPV** *Leukoplakia, S.C. Papilloma (HALLS)*

Gross: Nodule → fungating – malignant ulcer – infiltrative growth

Micro.: **Sq. C carcinoma** forming nests with different grades of keratinization

Types:

Glottic 65%	Supra or infra-glottic 35%
On true vocal cords	Above or below
Early hoarseness of voice → <u>early detection</u>	<i>ما قبل أعراض</i> Late detection
Well & moderately differentiated – Slowly growing	Poorly differentiated rapidly growing
Less metastasis to L.N.	More metastasis to L.N.
Better prognosis	Bad prognosis
	

Complications:

- Spread (Direct – Lymphatic – Blood)
- Hoarseness of voice
- Hemorrhage
- 2ry infection → Aspiration → Lung Abscess
- Cachexia
- *obstruction*



Obstructive Lung diseases	Restrictive lung diseases
Airway obstruction → resistance to airflow <u>Passive</u> - <u>Expiratory</u> Dyspnea 1. COPD - Emphysema - Chronic bronchitis 2. Bronchial Asthma 3. Bronchiectasis 4. Bronchial Cystic fibrosis	Reduced lung expansion <u>Inspiratory</u> Dyspnea 1. Pneumoconiosis 2. ARDS 3. Idiopathic fibrosis & (Sarcoidosis) 4. Non-pulmonary: Obesity, neurogenic, Kyphoscoliosis

Emphysema

Permanent **dilatation** & **destruction** of **air spaces** distal to terminal bronchioles

Aetiology & pathogenesis:

AT antagonise
elastase enz.



- **Smoking:** Excess inflammatory cells → secrete **Elastase** & **IL-8** → damage of Elastin → more inflammation
- **Genetic factors:**

- **α 1-AT deficiency** associated with neonatal jaundice & hepatitis
- **TGF-B mutation** → defective **Elastin repair**

True emphysema

Centri-acinar	Pan-acinar	Para septal	Irregular
-Dilated resp bronchiole Associated with smoking	-Dilated both resp. bronchiole & alveoli Associated with α1-AT deficiency	-dilated alveoli → Bulae Variable causes	Irregular focal dilatation Associated with scarring

More in <u>upper lobe</u> <i>لونه دغلي</i>	More in <u>lower lobe</u> <i>more vascular</i>	Peripheral, upper, <u>bullae</u> <i>الكهلات</i> are common	Irregular, patchy
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Other types (flase emphysema):

- **Compansatory**: distention following nearby collapse or lobectomy
- **Interstitial**: air accumulation in CT (chest injury or ruptured alveoli in interstitial tissue) → may accumulate subcutaneously → crepitation

التهور بضغط طالر الـ bl - لونه ابيض

Gross: Large, pale, containing Bullae - crepitus

Micro: Alveoli are Dilated & thin-walled → damaged (no fibrosis)

Complications:

- Pulmonary hypertension → right sided H F (common cause of death)
- Hypoxia → Cyanosis → Polycythemia
- Respiratory acidosis & coma (fatal)
- Bullae → pneumothorax (fatal) or interstitial emphysema
- Barrel-shaped chest



Chronic Bronchitis

Chronic inflammation with cough for 3 months in 2 consecutive years

Aetiology & p.f.: Smoking - Infection - Allergy

Pathogenesis: Irritants →

at. inf. → increased glands & goblet cells → excess secretion
- inflammatory cells → fibrosis

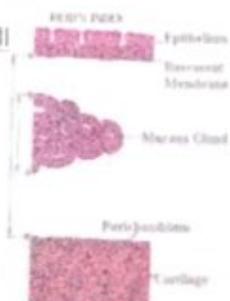
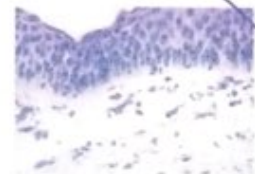
The end result is airway narrowing

Types:

- Simple: no obstruction
- Ashtmatic bronchitis
- Obstructive: chronic, with obstruction

Morphology:

- **Gross:** Swollen - contain secretions
- **Micro:** Chnric inflammation - gland proliferation - goblet cell metaplasia - sq. metaplasia → Pre cancerous
- **Reid index:** increased mucous gland thickness/wall thickness, >4/10



Bronchial asthma

Chronic inflammatory disease with Repeated **attacks** of **bronchoespasm** due to increased responsiveness to stimuli



Extrinsic	Intrinsic
Age: - Children and young P.F.: - Family history of allergy - Following exposure to Antigen - elevated IgE → Mast cell → degranulation Pathogenesis: Hypersensitivity type 1 (general) <i>Spontaneous Regression</i>	Age: - Older P.F.: - No Family history - following viral infection , drugs (aspirin) → <i>defect in its membrane & hist. pathway & LTs release</i> - Normal IgE levels CD4 → mediators → inflammation with excess eosinophils <i>Spontaneous Regression</i>

Gross:

d.t. hypertrophy → d.t. repeated attacks

- **Bronchi:** **Thick** wall → narrow
- **Mucous** plug (curshman spirals)
- **Lung:** **Over inflated** & **Focal collapse**

Micro:

- **Lumen:** *↑ mucus* mucous whorls (**curshman spirals**) + eosinophils debris (**Charcot-Leyden** crystals)
- **Mucosa:** thick **B.M.** & proliferated **glands** with **goblet cell metaplasia**
- **Wall:** inflammatory cells (excess **eosinophils** and **mast** cells) + inflammatory edema
- **Muscle:** hypertrophy *من كثر شغل*

C/P: Cough - Dyspnea (expiratory) - Wheezes



Bronchiectasis

Chronic **suppuration** characterized by Permanent **dilatation** & damage of **bronchi**

Aetiology & P.F.:

- **Infection** Pyogenic (Suppurative pneumonia), TB is a risk factor
- **Complete Obstruction**
 - Tumor
 - Foreign body
 - Congenital
 - **Cystic fibrosis** "**muco-vidcoidosis**"
 - Immotile cilia (**Kartegner syndrome**) → accumulated secretions



Pathogenesis:

- **Complete** Obstruction → **stasis** → **infection** → damage of elastic tissue of bronchi
- **Complete** Obstruction → alveolar **collapse** → increased -ve pressure → bronchil distention

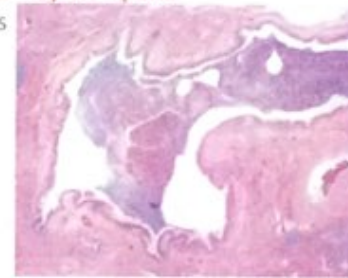


Site: Mostly lower lobe

Gross: Dilated & thin (cylindrical, saccular, fusiform) , contain **pus** - lung **fibrosis**

Micro:

- Lumen: necrotic tissue + pus cells
- Mucosa : ulceration – Hyperplasia – **dysplasia** – **sq. metaplasia**
- wall: inflammatory cells + necrosis → fibrosis



C/P: productive cough & Fever

Complications:

- **Carcinoma** (sq. cell carcinoma)
- **Right S H F** (due to lung fibrosis)
- **Abscess** → **2ry amyloidosis**
- **Spread** → Direct: Abscess & empyema – Blood: Toxemia, pyemia
- **Hemoptysis**

Pneumonia

Inflammation of lung parenchyma with **consolidation** (alveolar inflammation)

- **Bacterial:**
 - **Lobar** (consolidation of lobes)
 - **Lobular "Septic Bronchopneumonia"** (patchy focal consolidation)
 - TB pneumonia
- **Interstietial**

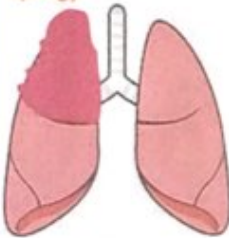
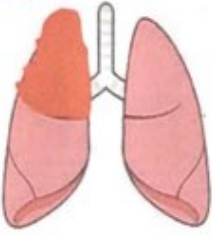
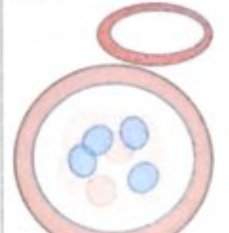


Lobar pneumonia

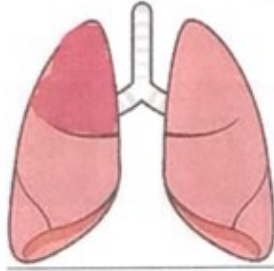
Acute Fibrinous inflammation of alveoli in one or more lobes

Aetiology: pneumococcal , **PF:** URTI, **splenectomy** (lack of immunity against pneumococci) , **Age:** Middle age **Site:** right lung, upper lobe

Pathology and Stages

	Congestion	Red Hepatization	Grey Hepatization	Resolution
	1 st day	After 2 nd day	After 4 th day	After 8 th day
Gross:	-enlarged lobe -Red -Spongy 	-enlarged -Red -Firm 	-enlarged -Grey brown -Firm 	-normal
Microscopic:	-Capillaries: Dilated congested -Alveoli contain: -Fluid exudate & fibrin -neutrophils 	-Capillaries: Dilated congested -Alveoli contain:- -fibrin -Neutrophils -RBCs 	-Capillaries: Less congested -Alveoli contain: -clumped fibrin -neutrophils-damaged RBCs 	Inflammatory products are phagocytosed → alveoli became <u>Normal!</u>

C.P. : Fever 40 , Cough (rusty sputum) , dyspnea due to consolidation , Chest pain due to pleurisy

	Lobar pneumonia	Lobular Bronchopneumonia
Type	Fibrinous inflammation	suppurative inflammation
Incidence	Young and middle age	Children and Old age (?)
Aetiology	Pneumococci	Pyogenic bacteria
P.F.	URTI Splenectomy (lack of R.E.cells & Ab)	Lowered immunity in extremes of age
Site	- Unilateral (more in right lung) - Single or multiple lobes 	- Bilateral - Patchy (lobular) - Basal & Bronchial suppuration 
Gross	- Firm lobes - Red or grey - Pleurisy and lymphadenitis	- Firm patches - yellow & containing pus - pleurisy and lymphadenitis
Microscopic	- Alveoli containing fibrinous inflammation - capillaries are dilated	- Alveoli and bronchioles containing Neutrophils and pus cells. - capillaries are dilated
Fate	- Resolution - Suppuration → lung Abscess - Spread: Direct (pericarditis, pleurisy), Blood (menegitis, or Toxemia → myocarditis and Zenker's degeneration) - Organization & Fibrosis	More complicated
Prognosis	Better	Worse

Atypical Interstitial pneumonia

Inflammation of **interstitial tissue** of the lung and **alveolar septa**. The alveolar cavity is free

Causes **Viral** (influenza, RSV, CMV) - Mycoplasma - Chlamydia

Gross: Patchy, red, enlarged

Micro:

Mild:

-Chronic inflammatory cells in **alveolar wall**

-Viral **inclusions** in cytoplasm

Severe : **extensive** congestion , edema or alveolar damage



Lung Abscess

Localized Suppurative inflammation of the lung, forming irregular cavity with pus

	Inhalation (Aspiration)	Pyæmic	Post pneumonic	Post broncheactic
Aetiology	-Aspiration of vomitus or necrotic tissue in coma, or following anaesthesia	Pyæmia	<i>Pneumonia</i>	<i>Brochiactasis</i>
Morphology:	- Right lung -Single - Lower lobe -Rounded lined by necrotic tissue, contain pus & air -chronic lined by fibrosis	- Bilateral -Multiple - small , yellow -surrounded by congestion	Single or multiple according to type	Similar to inhalation abscess

other types: Post-**traumatic** (penetrating injury) , Post-**neoplastic**, or direct spread from rib **osteomyelitis**, **actinomycosis**

Fate and complications

1- Spread

- a. Direct →
 - i. Empyema → fistula
 - ii. Pericarditis & mediastinitis
- b. Lymphatic → Lymphangitis, lymphadenitis
- c. Blood → **Bacteremia**, **toxemia**, **septicemia**, **pyaemia**

2- Fibrosis → pulmonary hypertension → right sided Heart Failure



- 3- Chronic lung abscess → 2ry amyloidosis
- 4- Ruptured cavity → pyo-pneumo-thorax
- 5- Hemoptysis
- 6- Gangrene

Lung gangrene

putrefaction following lung suppuration

Causes: Lung abscess – Bronchiectasis – pneumonia

Morphology: Black – soft friable (**moist** gangrene)



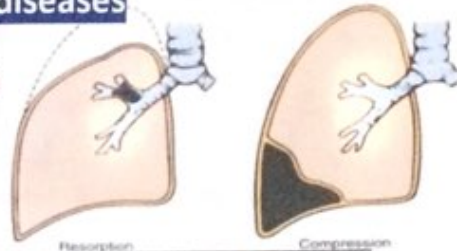
Suppurative Lung diseases:

Bronchopneumonia – Bronchiectasis – Empyema - Abscess & gangrene

Restrictive pulmonary diseases

Diseases characterized by limitation of lung expansion

Lung collapse



	Obstruction (Resorption)	Compression (pressure)	Contraction
Causes	<u>Complete obstruction</u> by (Tumor, F.B., Mucous plug) or <u>compression</u> on bronchi by tumor or LN, or aneurism	-Pericardial effusion -Pleural effusion -Pneumothorax -Ascitic effusion -Mediastinal Tumors, aneurism	Lung fibrosis Pleural fibrosis
Gross	-Lung size is normal - Focal collapse -airless, rubbery, cyanotic	-Lung size is reduced -airless, rubbery, cyanotic	-Lung size is reduced -airless, rubbery, cyanotic
Micro	-Collapsed alveoli (slit-like) -compressed capillaries -granular proliferated pneumocytes -fibrosis in old cases	same	Same

Congenital Atelectasis : Restriction of alveolar expansion in newborn, caused by prematurity, 'hyaline membrane' disease.

Acute Respiratory Distress (ARDS)

Causes: Acids, Toxins, Heroin, severe infections

- Increased mediators (TNF, IL-1, 18) → excess inflammatory exudate → alveolar damage & vascular damage & damage of pneumocytes II (decreased surfactant)

Fate: DIC in 3 days Late → fibrosis or respiratory failure

Micro: Alveoli: edema, necrosis, neutrophils & may show Hyaline membrane



Pneumoconiosis: ABAS

Lung diseases characterized by reaction to inhaled mineral dusts 1-5 microns.

- **Anthracois (Coal):**
 - o Coal workers, **smoking** & pollution → macrophages engulf **carbon**
 - o Asymptomatic anthracosis in most of cases
 - o Simple CWP: black macules + minimal **collagen**
 - o Complicated CWP: massive **fibrosis** - associated with **rheumatoid** (Caplan syndrome)
- **Brylliosis**: in Aerospace industries, leads to **granuloma** formation → fibrosis
- **Asbestosis**: in miners, shipyard insulators, milling,
 - Asbestos particles →
 - may lead to **Lung fibrosis** – **Pleural fibrosis** – **Lung Carcinoma** – **Mesothelioma**, **Laryngeal carcinoma**
- **Silicosis**: deposition of silica particles → hard granuloma in the apex → fibrosis increased **risk of TB** and carcinogenesis.

Broncheogenic Tumors

Benign Papilloma - Chondroma – Fibroma – angioma - leiomyoma

Locally Malignant: Carcinoid

Malignant

1ry Bronchogenic Carcinoma **95 %**, adenoid cystic, fibrosarcoma, leiomyosarcoma, lymphoma

2ry metastasis received from other sites

Carcinoid

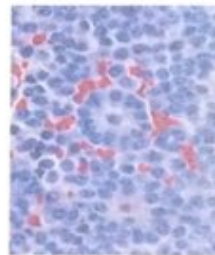
Locally malignant **Neuro-endocrine tumor** of bronchi & GIT

Incidence: about 40y

Gross: **Sub-mucosal** rounded or polypoid mass with intact mucosa → penetrates the wall downwards to peribronchial tissue (**collar-button** or **dumbbell** lesion)

Micro:

- o Solid masses of **rounded** cells – **rounded nuclei**
- o Separated by **fibrous** stroma
- o Atypical carcinoid: abnormal mitoses, & necrosis
- o E/M **secretory granules** could be detected



Complications:

- o Asymptomatic (peripheral types)
- o Spread → mainly **local** invasion, only 10% Lymphatic, & 5% blood spread
- o Hemoptysis
- o Obstruction
- o Rarely **Carcinoid syndrome** → Asthma - diarrhea – flushing (tumor secretes Histamine – serotonin)

Bronchogenic Carcinoma

Incidence: male > female 2:1, >50y

P.F.:

- **Smoking** AHCs (increased risk 10-60 folds), Air pollution
- Industrial: **Asbestos** (5 folds risk), **Arsenic**, Nickel, Chromium, mustard gas, vinyl chloride
- **Ionizing** radiation
- **Genetic** (inhibited P53, P16), (activated K-RAS, EGFr) in adenocarcinoma



Sites & Gross:

Central (hilar) 85%: grayish – Firm – Intraluminal mass – or Bulky infiltrative mass

Peripheral 15%: nodular

Microscopic types:

- 1- **Small cell carcinoma** (SCC) 2- **Non SCC** (Squamous C.C., Adeno C, Large C.C.)

	Small CC	Squamous cell carcinoma The most common in males	Adenoca. The most common in females	Large CC
Site	Central, hilar	Central, hilar	Peripheral	variable
P.F.	Smoking	Smoking	-Non smoker -Smokers	variable
P.L.	--	Squamous metaplasia	-Atypical adenomatous hyperplasia -Adenocarcinoma insitu	Squamous or adeno → undifferentiated
Micro	Sheets of <u>small cells</u> , <u>dark nucleus</u> , <u>necrosis & mitoses</u> , <u>secretory granules</u>	Squamous Cell nests with different grades	-Glands (acinar) -Papillary -Solid pattern	Large cells, Large nuclei, prominent nucleoli
Prognosis	The worst Metastasis b time of diagnosis	Rapid growth Late metastasis	Slow growth early metastasis	Variable
Paraneoplastic	Cushing	Hypercalcemia	--	--

Complications:**Local spread:**

- Bronchi : Collapse – bronchitis – bronchiectasis – Abscess – pneumonia
- Pleura: hemothorax – empyema – open into chest wall
- Others: SVC syndrome , Rib fracture, pericardial effusion, dysphagia & broncho-esophageal fistula, Horner's Syndrome

L.N. spread: Hilar → mediastinal → cervical , axillary, supraclav and others**Blood spread** → to different organs (Adrenals 50% – Liver – Brain – Bone)**Paraneoplastic syndrome:** 3-10%

SCC & Small CC may secrete hormones →

Hypercalcemia – Cushing – ADH (hyponatremia & water retention) – Neuromuscular disorders – Clubbing of fingers – Migratory thrombo-phlebitis

Pancoast tumor: apical tumor → invade sympathetic chain → **Horner's syndrome** (ptosis, miosis, anhidrosis, enophthalmos)**Adenocarcinoma in situ (Bronchoalveolar Carcinoma):**

rare peripheral type – nodules

micro: mucinous or non mucinous, columnar or cuboidal cells. **Single layer on alveolar septa**. Non invasive. No fibrous desmoplasia.

Malignant mesothelioma

Incidence: old males

P.F.: **Asbestos** exposure for more than 25 years

Gross: nodular – or diffuse thickening , gelatinous pink + pleural effusion

Micro:

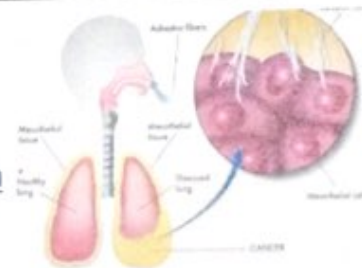
Epithelial: sheets of malignant epithelial cells or glands with papillae

Sarcomatoid: Malignant spindle cell sarcoma or (fibrosarcoma)

Mixed: both patterns are found.

Metastatic tumors of pleura: more common than mesothelioma . arise from lung, breast, ovaries

micro: **Hemorrhagic effusion** with malignant cells



Pleural Effusion

accumulation of fluid in pleura



Inflammatory:

	Plurisy	Empyema	Hemorrhagic plurisy
Morphology	Inflammatory exudate (sero-fibrinous) → heal by organization	Suppurative pluritis → Spread, lung collapse, brochopleural fistula	Blood + inflammatory exudate
causes	- Pneumonia -Autoimmune -uremia -radiation	-Direct from lung abscess , liver abscess -Post- traumatic (wound) - Pyemia & septicemia	Trauma – TB – Tumor & general causes

Non-Inflammatory:

	Hydrothorax	Hemothorax	Chylothorax
Fluid	Transudate	Blood	Lymph
causes	part of generalized edema	Ruptured aneurism → fatal	Obstruction of lymphatics by Tumor → ruptured lymph

Pneumothorax

Accumulation of Air in pleura

Causes: Ruptured **bullae** - Ruptured **TB cavity** - Ruptured **Abscess**
cavity - **Trauma**

Tension Pneumothorax: **Valve-like** injury leading to
accumulation of air in pleura during inspiration but **not exhaled**
during expiration → fatal